In-Situ Neutral Pressure Measurements in a Compact High-Field Tokamak, Alcator C-Mod*

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ABSTRACT

The Alcator C-Mod advanced divertor program requires fast, in-situ, absolutely calibrated neutral pressure measurements. The concept of a linear-geometry ionization gauge, first implemented at Princeton and Garching, was further developed at the MIT Plasma Fusion Center, to meet Alcator C-Mod requirements. Although gauges of similar design are being used on other tokamaks, nowhere else is the gauge subjected to such high magnetic fields as in Alcator (4.3T during the 1993 campaign.). Additionally, the compact design of Alcator imposes constraints on the location and mechanical design of the gauge. In order to interpret correctly experimental data, the gauge was subjected to a series of in-situ calibration tests. It has been found that the gauge sensitivity increases with increasing parallel (to gauge axis) magnetic field. In the high-pressure, high-field limit the basic assumption of the operation of ionization gauges, I/Ie<<1, no longer holds. However, when a different expression for sensitivity is used, the gauge response is linear over a broad pressure range. This sensitivity, is a strong function of the electron current. The MIT gauge was used during the 1993 operational campaign. A pressure build-up in the divertor was observed during diverted plasma discharges.

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